

What is claimed is:

1. A liquid crystal projector, comprising:
  - an illumination system for alternately emitting a first linearly polarized light beam and a second linearly polarized light beam having directions of polarization that differ by 90 degrees;
  - 5 a liquid crystal display device for modulating light beams from said illumination system;
  - a polarizing filter for filtering a specific polarization component of light beams from said liquid crystal display device; and
  - projection optics for projecting light from said polarizing filter.
2. A liquid crystal projector, comprising:
  - an illumination system for alternately emitting a first linearly polarized light beam and a second linearly polarized light beam having directions of polarization that differ by 90 degrees;
  - 5 a polarization beam splitter for receiving said first linearly polarized light beam and said second linearly polarized light beam from said illumination system and splitting said beams in different directions;
  - a first reflective liquid crystal display device for modulating said first linearly polarized light beam that has been split by said polarization beam
  - 10 splitter;
  - a second reflective liquid crystal display device for modulating said second linearly polarized light beam that has been split by said polarization beam splitter; and
  - projection optics;

15            wherein said polarization beam splitter combines the light beam that  
has been modulated by said first reflective liquid crystal display device and  
the light beam that has been modulated by said second reflective liquid crystal  
display device; and  
              said projection optics projects the light beams that have been  
20 combined by said polarization beam splitter.

3.        A liquid crystal projector according to claim 1, wherein said liquid  
crystal display device is transmissive or reflective.

4.        A liquid crystal projector according to claim 1, wherein said liquid  
crystal display device is constructed using a ferroelectric liquid crystal material.

5.        A liquid crystal projector according to claim 2, wherein said first  
reflective liquid crystal display device and said second reflective liquid crystal  
display device are constructed using a ferroelectric liquid crystal material.

6.        A liquid crystal projector according to claim 1, wherein said illumination  
system comprises:

              a light-emitting element array composed of a plurality of light-emitting  
elements, and

5            a polarization conversion element array;

              wherein said polarization conversion element array receives the light  
that is generated from a portion of the light-emitting elements of said light-  
emitting element array and emits said first linearly polarized light beam, and  
receives the light that is generated from the remaining light-emitting elements

10 of said light-emitting element array and emits said second linearly polarized light beam.

7. A liquid crystal projector according to claim 2, wherein said illumination system comprises:

a light-emitting element array composed of a plurality of light-emitting elements, and

5 a polarization conversion element array;

wherein said polarization conversion element array receives the light that is generated from a portion of the light-emitting elements of said light-emitting element array and emits said first linearly polarized light beam, and receives the light that is generated from the remaining light-emitting elements

10 of said light-emitting element array and emits said second linearly polarized light beam.

8. A liquid crystal projector according to claim 6, wherein said illumination system includes a plurality of combinations of said light-emitting element arrays and said polarization conversion element arrays.

9. A liquid crystal projector according to claim 7, wherein said illumination system includes a plurality of combinations of said light-emitting element arrays and said polarization conversion element arrays.

10. A liquid crystal projector according to claim 6, wherein one or a plurality of said light-emitting element arrays includes red light-emitting elements, green light-emitting elements, and blue light-emitting elements.

11. A liquid crystal projector according to claim 7, wherein one or a plurality of said light-emitting element arrays includes red light-emitting elements, green light-emitting elements, and blue light-emitting elements.

12. A liquid crystal projector according to claim 8, wherein one or a plurality of said light-emitting element arrays includes red light-emitting elements, green light-emitting elements, and blue light-emitting elements.

13. A liquid crystal projector according to claim 9, wherein one or a plurality of said light-emitting element arrays includes red light-emitting elements, green light-emitting elements, and blue light-emitting elements.

14. A liquid crystal projector according to claim 1, wherein said illumination system comprises:

a light source;

an emitted optical path switching means for alternately emitting light

5 beams from said light source in two directions;

a first polarization unifying means for converting light that is emitted in a first direction by said emitted optical path switching means to linearly polarized light;

10 a second polarization unifying means for converting light that is emitted in a second direction by said emitted optical path switching means to linearly polarized light; and

synthesizing optics for combining optical paths of the light from said first polarization unifying means and the light from said second polarization

unifying means;

- 15            wherein the direction of polarization of the polarized light that is emitted from said first polarization unifying means and the direction of polarization of the polarized light that is emitted from said second polarization unifying means forms an angle of 90 degrees.

15.    A liquid crystal projector according to claim 2, wherein said illumination system comprises:

          a light source;

- an emitted optical path switching means for alternately emitting light  
5    beams from said light source in two directions;

          a first polarization unifying means for converting light that is emitted in a first direction by said emitted optical path switching means to linearly polarized light;

- a second polarization unifying means for converting light that is emitted  
10   in a second direction by said emitted optical path switching means to linearly polarized light; and

          synthesizing optics for combining optical paths of the light from said first polarization unifying means and the light from said second polarization unifying means;

- 15            wherein the direction of polarization of the polarized light that is emitted from said first polarization unifying means and the direction of polarization of the polarized light that is emitted from said second polarization unifying means forms an angle of 90 degrees.

16.    A liquid crystal projector according to claim 14, wherein said light

source switches between emitting red light, green light, and blue light.

17. A liquid crystal projector according to claim 15, wherein said light source switches between emitting red light, green light, and blue light.

18. A liquid crystal projector according to claim 14, wherein said emitted optical path switching means includes a movable mirror for switching the direction in which received light is emitted.

19. A liquid crystal projector according to claim 15, wherein said emitted optical path switching means includes a movable mirror for switching the direction in which received light is emitted.

20. A liquid crystal projector according to claim 14, wherein said synthesizing optics includes a polarized light beam combiner for combining said first linearly polarized light beam and said second linearly polarized light beam.

21. A liquid crystal projector according to claim 15, wherein said synthesizing optics includes a polarized light beam combiner for combining said first linearly polarized light beam and said second linearly polarized light beam.

22. A liquid crystal projector according to claim 14, wherein said synthesizing optics includes a plurality of fixed mirrors and a movable mirror for switching received light.

23. A liquid crystal projector according to claim 15, wherein said synthesizing optics includes a plurality of fixed mirrors and a movable mirror for switching received light.

24. A liquid crystal projector according to claim 1, wherein said illumination system comprises:

a light source;

an emitted optical path switching means for alternately emitting light  
5 beams from said light source in two directions;

a first polarization unifying means for converting light that is emitted in a first direction by said emitted optical path switching means to linearly polarized light;

a second polarization unifying means for converting light that is emitted  
10 in a second direction by said emitted optical path switching means to linearly polarized light; and

synthesizing optics for combining optical paths of the light from said first polarization unifying means and the light from said second polarization unifying means;

15 wherein: said emitted optical path switching means includes a movable mirror for switching the direction in which received light is emitted;

said synthesizing optics includes a plurality of fixed mirrors and a movable mirror for switching received light;

a single movable mirror serves as both said movable mirror of said  
20 emitted optical path switching means and said movable mirror of said synthesizing optics; and

the direction of polarization of polarized light that is emitted from said first polarization unifying means and the direction of polarization of polarized light that is emitted from said second polarization unifying means form an  
25 angle of 90 degrees.

25. A liquid crystal projector according to claim 2, wherein said illumination system comprises:

- a light source;
- an emitted optical path switching means for alternately emitting light  
5 beams from said light source in two directions;
- a first polarization unifying means for converting light that is emitted in a first direction by said emitted optical path switching means to linearly polarized light;
- a second polarization unifying means for converting light that is emitted  
10 in a second direction by said emitted optical path switching means to linearly polarized light; and
- synthesizing optics for combining optical paths of the light from said first polarization unifying means and the light from said second polarization unifying means;
- 15 wherein: said emitted optical path switching means includes a movable mirror for switching the direction in which received light is emitted;
- said synthesizing optics includes a plurality of fixed mirrors and a movable mirror for switching received light;
- a single movable mirror serves as both said movable mirror of said  
20 emitted optical path switching means and said movable mirror of said synthesizing optics; and

the direction of polarization of polarized light that is emitted from said first polarization unifying means and the direction of polarization of polarized light that is emitted from said second polarization unifying means form an angle of 90 degrees.

26. A liquid crystal projector according to claim 2, wherein said first reflective liquid crystal display device is controlled by left-eye video signals, and said second reflective liquid crystal display device is controlled by right-eye video signals.

27. A liquid crystal projector, comprising:  
a polarization beam splitter for splitting received P-polarized light beam and S-polarized light beam in different directions;  
an illumination means for alternately directing a P-polarized light beam and an S-polarized light beam to said polarization beam splitter;  
a first reflective liquid crystal display device for modulating a P-polarized light beam that has been split by said polarization beam splitter;  
a second reflective liquid crystal display device for modulating an S-polarized light beam that has been split by said polarization beam splitter; and  
projection optics;  
wherein said polarization beam splitter combines the light beam that has been modulated by said first reflective liquid crystal display device and the light beam that has been modulated by said second reflective liquid crystal display device; and  
said projection optics projects the light beams that have been combined by said polarization beam splitter.

28. A liquid crystal projector according to claim 27, wherein said first reflective liquid crystal display device and said second reflective liquid crystal display device are constructed using a ferroelectric liquid crystal material.

29. A liquid crystal projector according to claim 27, wherein said illumination means comprises:

a light source;

an emitted optical path switching means for alternately emitting light  
5 beams from said light source in two directions;

a first polarization unifying means for converting light that has been emitted in a first direction by said [emitted] optical path switching means to linearly polarized light;

a second polarization unifying means for converting light that is emitted  
10 in a second direction by said emitted optical path switching means to linearly polarized light; and

synthesizing optics for combining optical paths of the light from said first polarization unifying means and the light from said second polarization unifying means;

15 wherein a direction of oscillation of an electric field of polarized light that is emitted from said first polarization unifying means and a direction of oscillation of an electric field of polarized light that is emitted from said second polarization unifying means form an angle of 90 degrees.

30. A liquid crystal projector according to claim 29, wherein said emitted optical path switching means includes a movable mirror for switching the

direction in which a received light is emitted.

31. A liquid crystal projector according to claim 29, wherein said synthesizing optics includes a polarized beam combiner for combining a P-polarized light beam and an S-polarized light beam.

32. A liquid crystal projector according to claim 29, wherein said synthesizing optics includes a plurality of fixed mirrors and a movable mirror for switching received light.

33. A liquid crystal projector according to claim 27, wherein:  
said first reflective liquid crystal display device and said second reflective liquid crystal display device are constructed using a ferroelectric liquid crystal material;

5 said illumination means comprises:

a light source;

an emitted optical path switching means for alternately emitting light beams from said light source in two directions;

a first polarization unifying means for converting light that is emitted in  
10 a first direction by said emitted optical path switching means to a linearly polarized light;

a second polarization unifying means for converting light that is emitted in a second direction by said emitted optical path switching means to a linearly polarized light; and

15 synthesizing optics for combining optical paths of the light from said first polarization unifying means and the light from said second polarization

unifying means;

wherein said emitted optical path switching means includes a movable mirror for switching the direction in which received light is emitted;

20        said synthesizing optics includes a plurality of fixed mirrors and a movable mirror for switching received light;

a single movable mirror serves as both said movable mirror of said emitted optical path switching means and said movable mirror of said synthesizing optics; and

25        a direction of oscillation of an electric field of polarized light that is emitted from said first polarization unifying means and a direction of oscillation of an electric field of polarized light that is emitted from said second polarization unifying means forms an angle of 90 degrees.

34.    A liquid crystal projector for displaying a stereoscopic image, said liquid crystal projector comprising:

a polarization beam splitter for splitting received P-polarized light beam and S-polarized light beam in two different directions;

5        an illumination means for alternately directing a P-polarized light beam and an S-polarized light beam to said polarization beam splitter;

a first reflective liquid crystal display device for modulating a P-polarized light beam that has been split by said polarization beam splitter;

10       a second reflective liquid crystal display device for modulating an S-polarized light beam that has been split by said polarization beam splitter; and projection optics;

wherein said illumination means comprises:

a light source;

an emitted optical path switching means for alternately emitting light  
15 beams from said light source in two directions;

a first polarization unifying means for converting light that is emitted in  
a first direction by said emitted optical path switching means to linearly  
polarized light;

a second polarization unifying means for converting light that is emitted  
20 in a second direction by said emitted optical path switching means to linearly  
polarized light; and

synthesizing optics for combining optical paths of the light from said  
first polarization unifying means and the light from said second polarization  
unifying means;

25 wherein:

a direction of oscillation of an electric field of polarized light that is  
emitted from said first polarization unifying means and a direction of  
oscillation of an electric field of polarized light that is emitted from said second  
polarization unifying means form an angle of 90 degrees;

30 said polarization beam splitter combines the light beam that has been  
modulated by said first reflective liquid crystal display device and the light  
beam that has been modulated by said second reflective liquid crystal display  
device;

said projection optics is a liquid crystal projector that projects the light  
35 beams that have been combined by said polarization beam splitter;

and wherein:

said first reflective liquid crystal display device and said second  
reflective liquid crystal display device alternately produce a left-eye image and  
a right-eye image, respectively, and said liquid crystal projector projects these

40 images onto a screen; and

the images that are projected onto a screen are viewed through polarization glasses in which a left-eye polarizing element and a right-eye polarizing element have different directions of polarization.

35. A liquid crystal projector for displaying a stereoscopic image according to claim 34, wherein the images that are projected on said screen are viewed through shutter glasses wherein a switching of the left- and right-eye images that are projected by said liquid crystal projector is synchronized with left- and  
5 right-eye shutters of said shutter glasses.